

APPENDIX A

Phonics Blocks, Phonetic Generalizations Outlined

Pass 1: *The first pass for each letter assigns the normal sound for that letter*

Pass 2:

When two of the same consonants appear side by side, only one is heard.

Example: "berry"

Pass 3:

'ch' = /ch/, phoneme #19

Example: cherry

Pass 4:

When the letters 'ght' are together, 'g' and 'h' are silent.

Example: 'night'

Pass 5:

The letter 'g' makes a soft sound before the letters 'e' and 'i'.

Example: "gem"

Pass 6:

The letter 'c' makes a soft sound before the letters 'e' and 'i'.

Example: "cent"

Pass 7:

When a word ends in 'ck', it has the /k/ sound.

Example: "sick"

Pass 8:

When a word begins with 'kn', the letter 'k' is silent.

Example: "know"

Pass 9:

When a word begins with 'wr', the letter 'w' is silent.

Example: "write"

Pass 10:

Words having a double 'e', usually have the long 'e' sound.

Example: "feet"

Passes 11 & 12:

The letter 'r' changes the quality of the preceding vowel.

Example: "burn"

Pass 13:

When the letter 'y' is the final vowel in a word, it usually has a vowel sound.

Example: "why"

Pass 14:

In 'ay', the 'y' is silent and gives 'a' its long sound.

Example: "play"

Pass 15:

If the only vowel is the final letter, it usually represents its long vowel sound.

Example: 'me'

Pass 16:

When the letter 'i' is followed by the letters 'gh', the 'i' is long and the 'g' and 'h' are silent.

Example: 'sigh'

Pass 17:

When two 'o's are next to each other, they represent the phoneme #43.

Example: 'moon'

Pass 18:

When the letters 'e' and 'w' are next to each other, they represent the phoneme #43.

Example: 'dew'

Pass 19:

When there is a 'u' followed by a consonant and an 'e', the 'u' represents the phoneme #43.

Example: 'dude'

Pass 20:

When the letters 'o' and 'u' are next to each other (in the form 'ou'), they represent the phoneme #42.

Example: 'proud'

Pass 21:

When the letter 'n' is directly preceded by 'g', the 'g' is silent.

Example: 'gnu'

Pass 22:

When the letter 'y' is directly preceded by 'o', they represent the phoneme #41.

Example: 'boy'

Pass 23:

When the letter 'h' is directly preceded by the letter 'w', they represent the phoneme #24.

Example: 'who'

Pass 24:

Silent 'e' - makes the preceding vowel long (when there is a consonant between the two).

Example: "name"

Pass 25:

When a word ends in 'ed', the preceding vowel represents its long vowel sound.

Example:

Pass 26:

When a word ends in 'es', the preceding vowel represents its long vowel sound.

Example:

Pass 27:

When a word ends in 'er', the preceding vowel represents its long vowel sound.

Example:

Pass 28:

When the letter 'u' is directly preceded by 'q', the 'q' represents phoneme #7 (/k/) and the 'u' represents the phoneme #16 (/w/).

Example: 'quilt'

Pass 29:

When the letter 'p' is directly followed by the letter 'h', they represent phoneme #3 (/f/).

Example: 'phonics'

Pass 30:

When the letter 'n' is directly followed by the letter 'g', the 'n' represents phoneme #25 and the 'g' is silent. *Note, this needs to be changed in the code.

Example: 'phonics'

Pass 31:

When the letter 's' is directly followed by the letter 'h', they represent the phoneme #20.

Example: 'shut'

Pass 32:

When the letter 't' is directly followed by the letter 'h', they represent the phoneme #22.

Example: 'the'

Pass 33:

When the letter 'a' is directly followed by the letter 'w', they represent the phoneme #40.

Example: 'draw'

Pass 34:

When the letter 'a' is directly followed by the letter 'i', they represent the phoneme #26.

Example: 'paid'

Pass 35:

When the letter 'o' is directly followed by the letter 'a', they represent the phoneme #29.

Example: 'boat'

Pass 36:

When the letter 'e' is directly followed by the letter 'a', they represent the phoneme #27.

Example: 'pea'

Pass 37:

When the letters 'ould' appear in this order, they represent the phoneme sequence 44, 44, 0, 2

Example: 'could'

Pass 38:

When the letters 'tion' appear in this order, they represent the phoneme sequence 20, 20, 36, 10

Example: 'nation'

Pass 39:

When the letters 'sion' appear in this order, they represent the phoneme sequence 20, 20, 36, 10

Example: 'tension'

Pass 40:

When there are two 'c's followed by 'e' or 'i', the first 'c' represents a hard sound (/k/), and the second 'c' represents a soft sound (/s/).

Example: 'success'

Pass 41:

When the letter 'o' is directly followed by the letter 'i', they represent the phoneme #41.

Example: 'foil'

Pass 42:

When 's' is the last letter in a word, it represents the sound /z/.

Example: 'faces'

Pass 43:

When the letters 'tch' appear in this order, the 't' is silent.

Example: 'itch'

Pass 44:

When the letters 'r' or 'k' are directly followed by 'h', the 'h' is silent.

Example: 'rhino'

Pass 45:

When the letter 'm' is directly followed by the letter 'b', the 'b' is silent.

Example: 'lamb'

Pass 46:

When the letters 'k' or 'm' are directly preceded by the letter 'l', the 'l' is silent.

Example: 'talk', 'calm'

Pass 47:

When the letter 'b' is directly followed by the letter 't' at the end of a word, the 'b' is silent.

Example: 'debt'

Pass 48:

When the letter 'm' is directly followed by the letter 'n', the 'n' is silent.

Example: 'hymn'

Pass 49:

When an 'h' is the last letter of a word and is directly preceded by a vowel, the 'h' is silent.

Example: '

Pass 50:

When the string of letters 'who' are at the beginning of a word, the 'w' is silent.

Example: 'who'

Pass 100:

When the letter 'd' is directly followed by the letter 'g' or the letter 'j', the 'd' is silent.

Example: 'judge', 'adjust'

Pass 101:

When the letter 's' is directly followed by the letter 'm' at the end of a word, the 's' has a /z/ sound.

Example: 'chasm'

APPENDIX B

```

/vpass1 {
  0 1   wlen {
    /x exch def
    workingvword 1 get           // array
    x
    Alphabet word x get get    // array int
    /snorm get                  // array int dict
    put
    workingvword 2 get
    x 1 x bitshift put
  } for
} def

// double consonants

/vpass2 {
  /prev '!' def
  0 1   wlen {
    /x exch def
    word x get prev eq {
      x x 1 sub light2gether
    } if
    /prev word x get def
  } for
} def

// ch

/vpass3 {
  /prev '!' def
  0 1   wlen {
    /x exch def
    word x get 'h' eq prev 'c' eq and {
      x x 1 sub light2gether
      "19" x soundlikethis
      "19" x 1 sub soundlikethis
    } if
    /prev word x get def
  } for
} def

// ght

/vpass4 {
  2 1   wlen {
    /x exch def
    word x get 't' eq {
      word x 1 sub get 'h' eq
      word x 2 sub get 'g' eq
    }
  }
}

```

```

        and {
            x x 1 sub x 2 sub light3gether
            "0" x 1 sub soundlikethis
            "0" x 2 sub soundlikethis
        } if
    } if
} for
} def

// soft 'g'
/vpass5 {
    0 1    wlen 1 sub {
        /x exch def
        word x get 'g' eq {
            word x 1 add get 'i' eq
            word x 1 add get 'e' eq
            or {
                x x 1 add lighthistoo
                "6" x soundlikethis
            } if
        } if
    } if
} for
} def

// soft 'c'
/vpass6 {
    0 1    wlen 1 sub {
        /x exch def
        word x get 'c' eq {
            word x 1 add get 'i' eq
            word x 1 add get 'e' eq
            or {
                x x 1 add lighthistoo
                "13" x soundlikethis
            } if
        } if
    } if
} for
} def

// 'ck' at the end
/vpass7 {
    word wlen 2 sub get 'c' eq {
        word wlen 1 sub get 'k' eq {
            wlen 2 sub wlen 1 sub light2gether
            "7" wlen 2 sub soundlikethis
        } if
    } if
} def

```

```

        "7" wlen 1 sub soundlikethis
    } if
} if
} def

// 'kn' at the beginning
/vpass8 {
    word 0 get 'k' eq {
        word 1 get 'n' eq {
            0 1 lightthistoo
            "0" 0 soundlikethis
        } if
    } if
} def

// 'wr' at the beginning
/vpass9 {
    word 0 get 'w' eq {
        word 1 get 'r' eq {
            0 1 lightthistoo
            "0" 0 soundlikethis
        } if
    } if
} def

// double e
/vpass10 {
    /prev '.' def
    0 1      wlen {
        /x exch def
        word x get 'e' eq prev 'e' eq and {
            x x 1 sub light2gether
            "27" x soundlikethis
            "27" x 1 sub soundlikethis

        } if
        /prev word x get def
    } for
} def

// vowel preceeds 'r'
/vpass11 {
    1 1      wlen {
        /x exch def
        word x get 'r' eq {

```

```

word x 1 sub get 'i' eq {
    "38" x soundlikethis
    "38" x 1 sub soundlikethis
    x 1 sub x lighthistoo
} if
word x 1 sub get 'u' eq {
    "38" x soundlikethis
    "38" x 1 sub soundlikethis
    x 1 sub x lighthistoo
} if
word x 1 sub get 'e' eq {
    "38" x soundlikethis
    "38" x 1 sub soundlikethis
    x 1 sub x lighthistoo
} if
word x 1 sub get 'a' eq {
    "39" x soundlikethis
    "39" x 1 sub soundlikethis
    x 1 sub x lighthistoo
} if
word x 1 sub get 'o' eq {
    "48" x soundlikethis
    "48" x 1 sub soundlikethis
    x 1 sub x lighthistoo
} if
} if
/prev word x get def
} for
} def

/vpass12 {
    1 1 wlen 1 sub {
        /x exch def
        word x get 'r' eq word x 1 add get 'e' eq and {
            word x 1 sub get 'a' eq {
                // the 'a'
                "37" x 1 sub soundlikethis
                x 1 sub x lighthistoo
                x 1 sub x 1 add lighthistoo
                // the 'e'
                "0" x 1 add soundlikethis
                x 1 add x 1 sub lighthistoo
            } if
            word x 1 sub get 'o' eq {
                "48" x 1 sub soundlikethis

```

```

        x 1 sub x lighthistoo
        x 1 sub x 1 add lighthistoo
        // the 'e'
        "0" x 1 add soundlikethis
        x 1 add x 1 sub lighthistoo
    } if
} if
/prev word x get def
} for
} def

```

```

/vpass13 {
    word wlen 1 sub get 'y' eq {
        countvowels 0 eq {
            "28" wlen 1 sub soundlikethis

        }{
            "27" wlen 1 sub soundlikethis

        } ifelse
    } if
} def

```

```

/vpass14 {
    1 1 wlen {
        /x exch def
        word x get 'y' eq {
            word x 1 sub get 'a' eq {
                "26" x 1 sub soundlikethis
                "0" x soundlikethis
                x x 1 sub light2gether
            } if
        } if
    } for
} def

```

```

/vpass15 {
    countvowels 1 eq {
        /pos wlen 1 sub def
        /letter word wlen 1 sub get def
        letter 'e' eq {
            "27" pos soundlikethis
        } if
        letter 'i' eq {
            "28" pos soundlikethis
        } if
    } if
} def

```

```

        } if
        letter 'o' eq {
            "29" pos soundlikethis
        } if
    } if
} def

/vpass16 {
    2 1    wlen {
        /x exch def
        word x get 'h' eq word x 1 sub get 'g' eq and {
            word x 2 sub get 'i' eq {
                "0" x soundlikethis
                "0" x 1 sub soundlikethis
                "28" x 2 sub soundlikethis
                x x 1 sub x 2 sub light3gether
            } if
        } if
    } for
} def

// double o
/vpass17 {
    /prev '!' def
    0 1    wlen {
        /x exch def
        word x get 'o' eq prev 'o' eq and {
            x x 1 sub light2gether
            "43" x soundlikethis
            "43" x 1 sub soundlikethis

        } if
        /prev word x get def
    } for
} def

// ew
/vpass18 {
    1 1    wlen {
        /x exch def
        word x get 'w' eq word x 1 sub get 'e' eq and {
            x x 1 sub light2gether
            "43" x soundlikethis
            "43" x 1 sub soundlikethis
        } if
    } if
} def

```

```

        } if
    } for
} def

// u consonant e
/vpass19 {
2 1   wlen {
/x exch def
word x get 'e' eq word x 2 sub get 'u' eq and {
    word x 1 sub get isconsonant {
        x x 2 sub light2gether
        "0" x soundlikethis
        "43" x 2 sub soundlikethis
    } if
} if
} for
} def

// 'ou'
/vpass20 {
1 1   wlen {
/x exch def
word x get 'u' eq word x 1 sub get 'o' eq and {
    x x 1 sub light2gether
    "42" x soundlikethis
    "42" x 1 sub soundlikethis
} if
} for
} def

// 'gn'
/vpass21 {
1 1   wlen {
/x exch def
word x get 'n' eq word x 1 sub get 'g' eq and {
    x 1 sub x lighthistoo
    "0" x 1 sub soundlikethis
} if
} for
} def

// oy
/vpass22 {
0 1   wlen 1 sub {
/x exch def

```

```

word x get 'o' eq
word x 1 add get 'y' eq and {
    "41" x soundlikethis
    "41" x 1 add soundlikethis
    x x 1 add light2gether
} if
} for
} def

```

```

// 'wh'
/vpass23 {
    /prev '.' def
    0 1 wlen {
        /x exch def
        word x get 'h' eq prev 'w' eq and {
            x x 1 sub light2gether
            "24" x soundlikethis
            "24" x 1 sub soundlikethis
        } if
        /prev word x get def
    } for
} def

```

```

// silent 'e' at end
/vpass24 {
    word wlen 1 sub get 'e' eq {
        countvowels 2 eq {
            word wlen 2 sub get isconsonant {
                "0" wlen 1 sub soundlikethis
                0 1 wlen 2 sub {
                    /x exch def
                    /letter word x get def
                    letter 'a' eq {
                        "26" x soundlikethis
                        wlen 1 sub x light2gether
                    } if
                    letter 'e' eq {
                        "27" x soundlikethis
                        wlen 1 sub x light2gether
                    } if
                    letter 'i' eq {
                        "28" x soundlikethis
                        wlen 1 sub x light2gether
                    } if
                }
            }
        }
    }
}
```

```

letter 'o' eq {
    "29" x soundlikethis
    wlen 1 sub x light2gether
} if
letter 'u' eq {
    "43" x soundlikethis
    wlen 1 sub x light2gether
} if
} if
} for
} if
} if
} def

// ed
/vpass25 {
word wlen 1 sub get 'd' eq word wlen 2 sub get 'e' eq and {
    countvowels 2 eq {
        word wlen 3 sub get isconsonant {
            "0" wlen 2 sub soundlikethis // e silent
            0 1 wlen 3 sub {
                /x exch def
                /letter word x get def
                letter 'a' eq {
                    "26" x soundlikethis
                    wlen 2 sub x light2gether
} if
                letter 'e' eq {
                    "27" x soundlikethis
                    wlen 2 sub x light2gether
} if
                letter 'i' eq {
                    "28" x soundlikethis
                    wlen 2 sub x light2gether
} if
                letter 'o' eq {
                    "29" x soundlikethis
                    wlen 2 sub x light2gether
} if
                letter 'u' eq {
                    "43" x soundlikethis
                    wlen 2 sub x light2gether
} if
} for
} if

```

```

        } if
    } if
} def

// es
/vpass26 {
    word wlen 1 sub get 's' eq word wlen 2 sub get 'e' eq and {
        countvowels 2 eq {
            word wlen 3 sub get isconsonant {
                "0" wlen 2 sub soundlikethis // e silent
                0 1 wlen 3 sub {
                    /x exch def
                    /letter word x get def
                    letter 'a' eq {
                        "26" x soundlikethis
                        wlen 2 sub x light2gether
                    } if
                    letter 'e' eq {
                        "27" x soundlikethis
                        wlen 2 sub x light2gether
                    } if
                    letter 'i' eq {
                        "28" x soundlikethis
                        wlen 2 sub x light2gether
                    } if
                    letter 'o' eq {
                        "29" x soundlikethis
                        wlen 2 sub x light2gether
                    } if
                    letter 'u' eq {
                        "43" x soundlikethis
                        wlen 2 sub x light2gether
                    } if
                } for
            } if
        } if
    } if
} def

// er
/vpass27 {
    word wlen 1 sub get 'r' eq word wlen 2 sub get 'e' eq and {
        countvowels 2 eq {
            word wlen 3 sub get isconsonant {
                "38" wlen 1 sub soundlikethis      //

```

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

```
"38" wlen 2 sub soundlikethis      //  
wlen 1 sub wlen 2 sub light2gether  
  
0 1 wlen 3 sub {  
    /x exch def  
    /letter word x get def  
    letter 'a' eq {  
        "26" x soundlikethis  
        x wlen 2 sub lighthistoo  
    } if  
    letter 'e' eq {  
        "27" x soundlikethis  
        x wlen 2 sub lighthistoo  
    } if  
    letter 'i' eq {  
        "28" x soundlikethis  
        x wlen 2 sub lighthistoo  
    } if  
    letter 'o' eq {  
        "29" x soundlikethis  
        x wlen 2 sub lighthistoo  
    } if  
    letter 'u' eq {  
        "30" x soundlikethis  
        x wlen 2 sub lighthistoo  
    } if  
    } for  
} if  
} if  
} def  
  
// qu  
/vpass28 {  
0 1 wlen 1 sub {  
    /x exch def  
    word x get 'q' eq word x 1 add get 'u' eq and {  
        "46" x soundlikethis  
        "46" x 1 add soundlikethis  
        x x 1 add light2gether  
    } if  
} for  
} def  
  
// ph
```

//ng

```
/vpass29 {
  0 1  wlen 1 sub {
    /x exch def
    word x get 'p' eq word x 1 add get 'h' eq and {
      x x 1 add light2gether
      "3" x soundlikethis
      "3" x 1 add soundlikethis
    } if
  } for
} def
```

//sh

```
/vpass30 {
  0 1  wlen 1 sub {
    /x exch def
    word x get 'n' eq word x 1 add get 'g' eq and {
      x x 1 add light2gether
      "25" x soundlikethis
      "25" x 1 add soundlikethis
    } if
  } for
} def
```

//th

```
/vpass31 {
  0 1  wlen 1 sub {
    /x exch def
    word x get 's' eq word x 1 add get 'h' eq and {
      x x 1 add light2gether
      "20" x soundlikethis
      "20" x 1 add soundlikethis
    } if
  } for
} def
```

```
/vpass32 {
  0 1  wlen 1 sub {
    /x exch def
    word x get 't' eq word x 1 add get 'h' eq and {
      x x 1 add light2gether
      "22" x soundlikethis
      "22" x 1 add soundlikethis
    } if
  } for
```

```

} def

// aw
/vpass33 {
    word wlen 2 sub get 'a' eq
    word wlen 1 sub get 'w' eq and {
        wlen 2 sub wlen 1 sub light2gether
        "40" wlen 2 sub soundlikethis
        "40" wlen 1 sub soundlikethis
    } if
} def

// ai
/vpass34 {
    0 1 wlen 1 sub {
        /x exch def
        word x get 'a' eq word x 1 add get 'i' eq and {
            x x 1 add light2gether
            "26" x soundlikethis
            "26" x 1 add soundlikethis
        } if
    } for
} def

// oa
/vpass35 {
    0 1 wlen 1 sub {
        /x exch def
        word x get 'o' eq word x 1 add get 'a' eq and {
            x x 1 add light2gether
            "29" x soundlikethis
            "29" x 1 add soundlikethis
        } if
    } for
} def

// ea
/vpass36 {
    0 1 wlen 1 sub {
        /x exch def
        word x get 'e' eq word x 1 add get 'a' eq and {
            x x 1 add light2gether
            "27" x soundlikethis
            "27" x 1 add soundlikethis
        } if
    } for
} def

```

```

        } for
    } def

        // ould
/vpass37 {
    0 1    wlen 3 sub {
        /x exch def
        word x get 'o' eq word x 1 add get 'u' eq and {
            word x 2 add get 'l' eq word x 3 add get 'd' eq and {
                x x 1 add light2gether
                "44" x soundlikethis
                "44" x 1 add soundlikethis
                "0" x 2 add soundlikethis
                x 2 add x lighthistoo
                x 2 add x 1 add lighthistoo
                x 2 add x 3 add lighthistoo
            } if
        } if
    } for
} def

        // tion
/vpass38 {
    0 1    wlen 3 sub {
        /x exch def
        word x get 't' eq word x 1 add get 'i' eq and {
            word x 2 add get 'o' eq word x 3 add get 'n' eq and {
                "20" x soundlikethis
                "20" x 1 add soundlikethis
                "36" x 2 add soundlikethis
                x x 1 add x 2 add light3gether
                x x 3 add lighthistoo
                x 1 add x 3 add lighthistoo
                x 3 add x 3 add lighthistoo
            } if
        } if
    } for
} def

        // sion
/vpass39 {
    0 1    wlen 3 sub {
        /x exch def
        word x get 's' eq word x 1 add get 'i' eq and {
            word x 2 add get 'o' eq word x 3 add get 'n' eq and {

```

```

        "20" x soundlikethis
        "20" x 1 add soundlikethis
        "36" x 2 add soundlikethis
        x x 1 add x 2 add light3gether
        x x 3 add lighthistoo
        x 1 add x 3 add lighthistoo
        x 3 add x 3 add lighthistoo
    } if
} if
} for
} def

// cc[ei]
/vpass40 {
0 1    wlen 2 sub {
/x exch def
word x get 'c' eq word x 1 add get 'c' eq and {
    word x 2 add get 'e' eq
    word x 2 add get 'i' eq and {
        "7" x soundlikethis
        "13" x 1 add soundlikethis
        x x 1 add light2gether
        x x 2 add lighthistoo
        x 1 add x 2 add lighthistoo
    } if
} if
} for
} def

// oi
/vpass41 {
0 1    wlen 1 sub {
/x exch def
word x get 'o' eq
word x 1 add get 'i' eq and {
    x wlen 3 sub ge {           // if there can't be an 'ng'
        "41" x soundlikethis
        "41" x 1 add soundlikethis
        x x 1 add light2gether
    }{
        // not n == false, not g == false
        word x 2 add get 'n' ne
        word x 3 add get 'g' ne or {
            "41" x soundlikethis
            "41" x 1 add soundlikethis

```

```

          x x 1 add light2gether
      } if
  } ifelse
} if
} for

} def

// s at end
/vpass42 {
word wlen 1 sub get 's' eq
wlen 2 ge and {
    wlen 2 sub getthissound isvoiced {
        "18" wlen 1 sub soundlikethis

    } {
        wlen 3 ge {
            wlen 2 sub getthissound issilent {
                wlen 3 sub getthissound isvoiced {
                    "18" wlen 1 sub soundlikethis
                } if
            } if
        } if
    } ifelse
} if
} def

// tch
/vpass43 {
2 1 wlen {
/x exch def
word x get 'h' eq {
    word x 1 sub get 'c' eq
    word x 2 sub get 't' eq
    and {
        "0" x 2 sub soundlikethis
        x 2 sub x 1 sub lighthistoo
        x 2 sub x lighthistoo
    } if
} if
} for
} def

// rh - kh
/vpass44 {

```

```
1 1    wlen {
/x exch def
word x get 'h' eq {
    word x 1 sub get 'r' eq
    word x 1 sub get 'k' eq or {
        "0" x soundlikethis
        x x 1 sub lighthistoo
    } if
} if
} for
} def
```

```
// mb
/vpass45 {
1 1    wlen {
/x exch def
word x get 'b' eq {
    word x 1 sub get 'm' eq {
        "0" x soundlikethis
        x x 1 sub lighthistoo
    } if
} if
} for
} def
```

```
// lk - lm
/vpass46 {
0 1    wlen 1 sub {
/x exch def
word x get 'l' eq {
    word x 1 add get 'm' eq
    word x 1 add get 'k' eq or {
        "0" x soundlikethis
        x x 1 add lighthistoo
    } if
} if
} for
} def
```

```
// bt at the end
/vpass47 {
word wlen 1 sub get 't' eq
word wlen 2 sub get 'b' eq and {
```

```

        "0" wlen 2 sub soundlikethis
        wlen 2 sub wlen 1 sub lighthistoo
    } if
} def

// mn
/vpass48 {
    0 1    wlen 1 sub {
        /x exch def
        word x get 'm' eq {
            word x 1 add get 'n' eq {
                "0" x 1 add soundlikethis
                x 1 add x lighthistoo
            } if
        } if
    } for
} def

// vowel h at end
/vpass49 {
    word wlen 1 sub get 'h' eq {
        word wlen 2 sub get isvowel {
            "0" wlen 1 sub soundlikethis
            wlen 1 sub wlen 2 sub lighthistoo
        } if
    } if
} def

// 'who' at beginning of word (must fix up wh rule)
/vpass50 {
    wlen 3 ge {
        word 0 get 'w' eq {
            word 1 get 'h' eq
            word 2 get 'o' eq and {
                "0" 0 soundlikethis
                "5" 1 soundlikethis           // h back to before wh rule
                0 1 lighthistoo
                0 2 lighthistoo
            } if
        } if
    } if
} def

// d - j sound
/vpass100 {

```

```

0 1  wlen 1 sub {
  /x exch def
  word x get 'd' eq {
    x 1 add getthissound "6" eq {
      "0" x soundlikethis
      x x 1 add lighthistoo
    } if
  } if
} for
} def

// ? sm
/vpass101 {
  1 1  wlen 1 sub {
    /x exch def
    word x get 's' eq word x 1 add get 'm' eq and {
      x 1 sub getthissound isvoiced {
        "18" x soundlikethis
        x x 1 add lighthistoo
        x x 1 sub lighthistoo
      } if
    } if
  } for
} def

/lastpass {
  workingvword 2 get {
    itoahex
  } foreach
} def

/light2gether {
  /x1 exch def
  /x2 exch def
  /lights workingvword 2 get def
  lights x1 lights x1 get 1 x2 bitshift or put
  lights x2 lights x2 get 1 x1 bitshift or put
} def

/light3gether {
  /x3 exch def

```

```
/x2 exch def
/x1 exch def
/lights workingvword 2 get def
lights x1 lights x1 get 1 x2 bitshift or put
lights x1 lights x1 get 1 x3 bitshift or put
lights x2 lights x2 get 1 x1 bitshift or put
lights x2 lights x2 get 1 x3 bitshift or put
lights x3 lights x3 get 1 x1 bitshift or put
lights x3 lights x3 get 1 x2 bitshift or put
} def
```

```
/lighthistoo {
/x2 exch def
/x1 exch def
/lights workingvword 2 get def
lights x1 lights x1 get 1 x2 bitshift or put
} def
```

```
/soundlikethis {
/x1 exch def
/xs exch def
/sounds workingvword 1 get def
sounds x1 xs put
} def
```

```
/getthissound {
workingvword 1 get exch get
} def
```

```
/countvowels {
0
word {
/x exch def
x 'a' eq
x 'e' eq or
x 'i' eq or
x 'o' eq or
x 'u' eq or
{
1 add
} if
} forall
} def
```

```
/vowels "aeiou" def

/isvowel {
    /l exch def
    false
    vowels {
        l eq or
    } forall
} def

/consonants "bcdfghjklmnpqrstvwxyz" def

/isconsonant {
    /l exch def
    false
    consonants {
        l eq or
    } forall
} def

/voiced [ "1" "2" "4" "6" "8" "9" "10" "12" "15" "16" "17" "18" "21" "23" "25" "26" "27" "28" "29"
"30" "31" "32" "33" "34" "35" "36" "37" "38" "39" "40" "41" "42" "43" "44" ] def

/isvoiced {
    /ss exch def
    false
    voiced {
        ss eq or
    } forall
} def

/issilent {
    "0" eq
} def

/dumpword {
    dup 0 get print
    dup 1 get { cvs ", " cat prin } forall
    "" print
    dup 2 get { cvs ", " cat prin } forall
    "" print
    3 get print
```

APPENDIX C

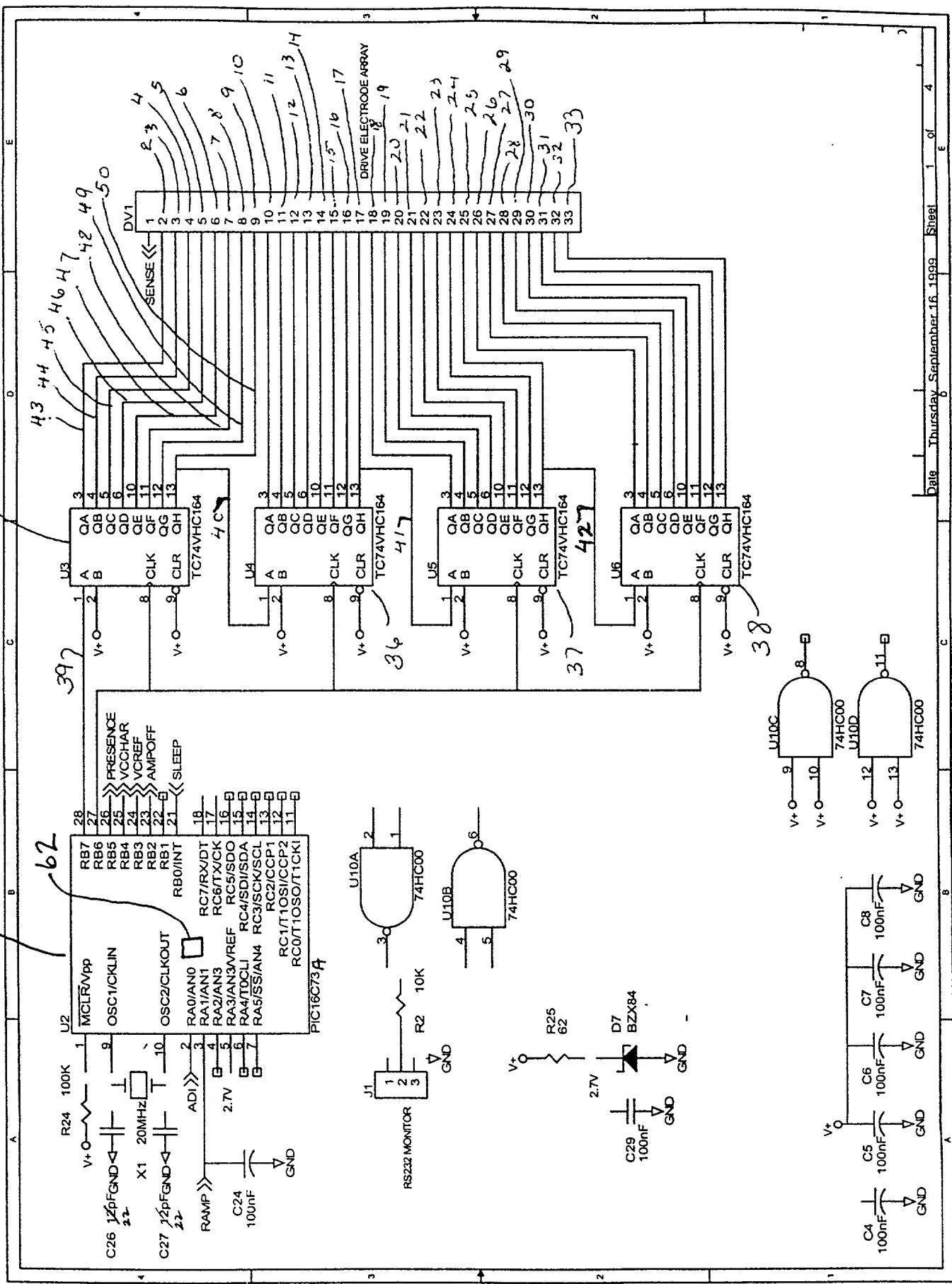


FIG. 2

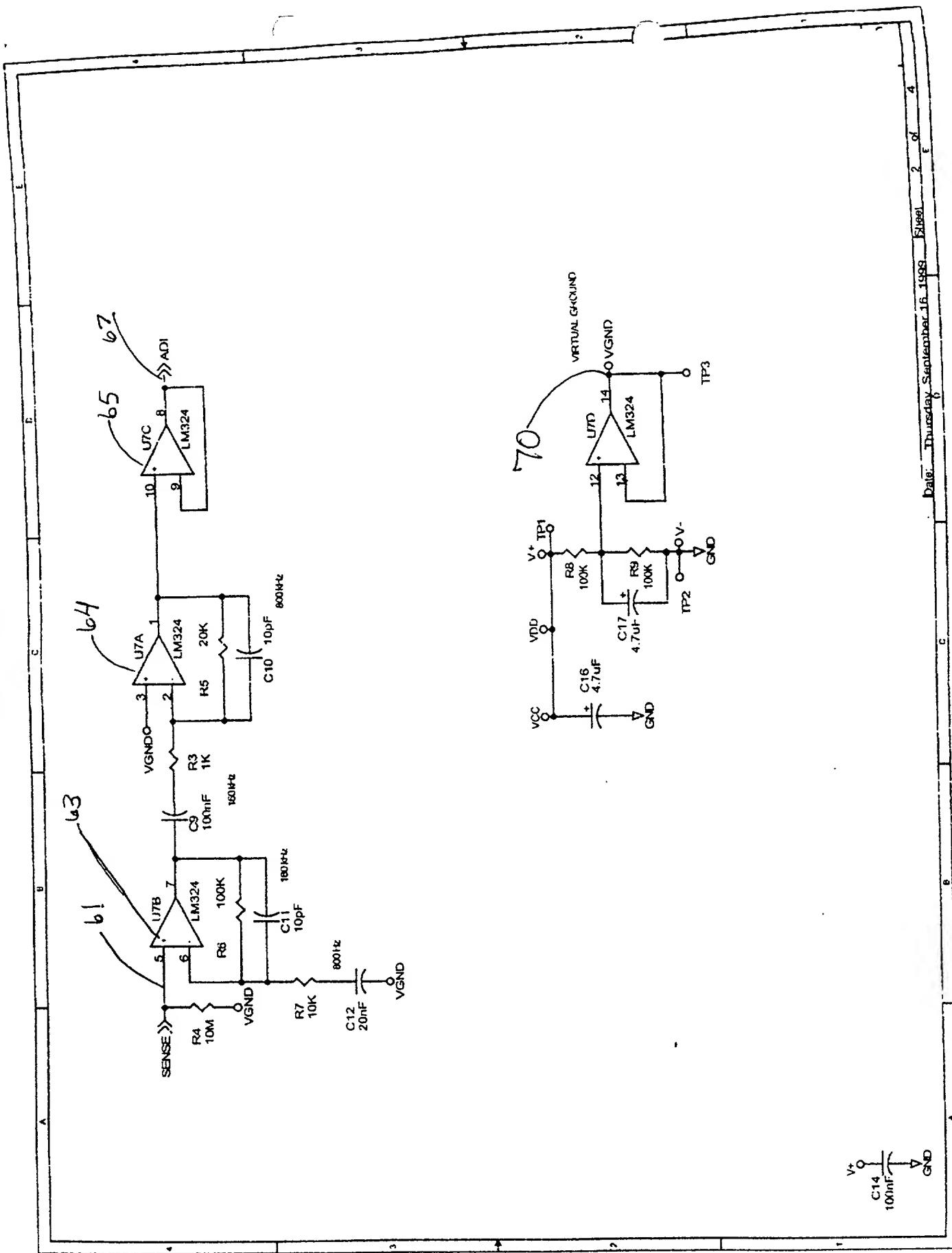


FIG. 3

Date: Thursday, September 16, 1998

Page: 2

Sheet: 4

Page: 2

Sheet: 4

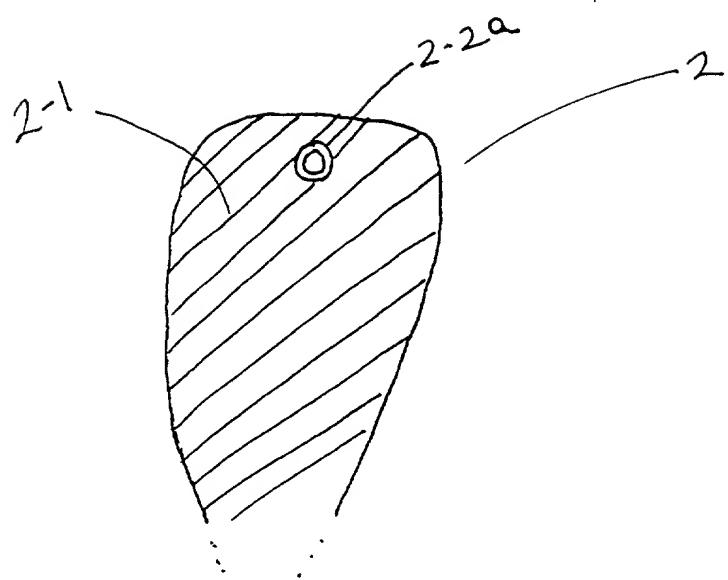


FIG. 4a

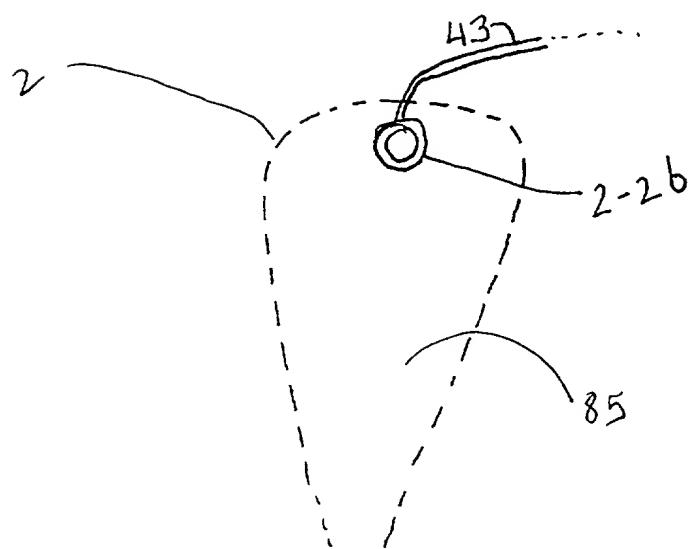


FIG. 4b

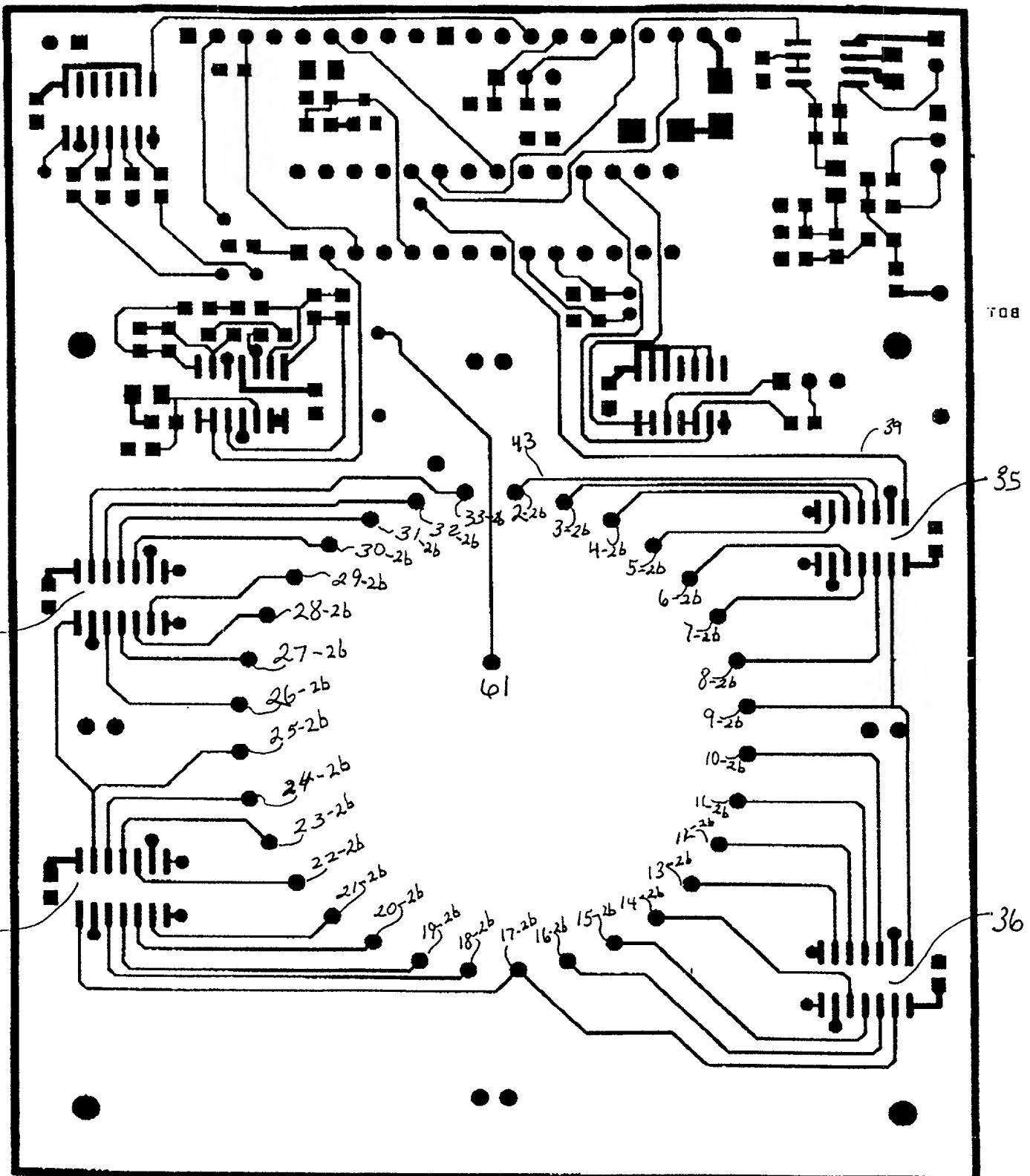
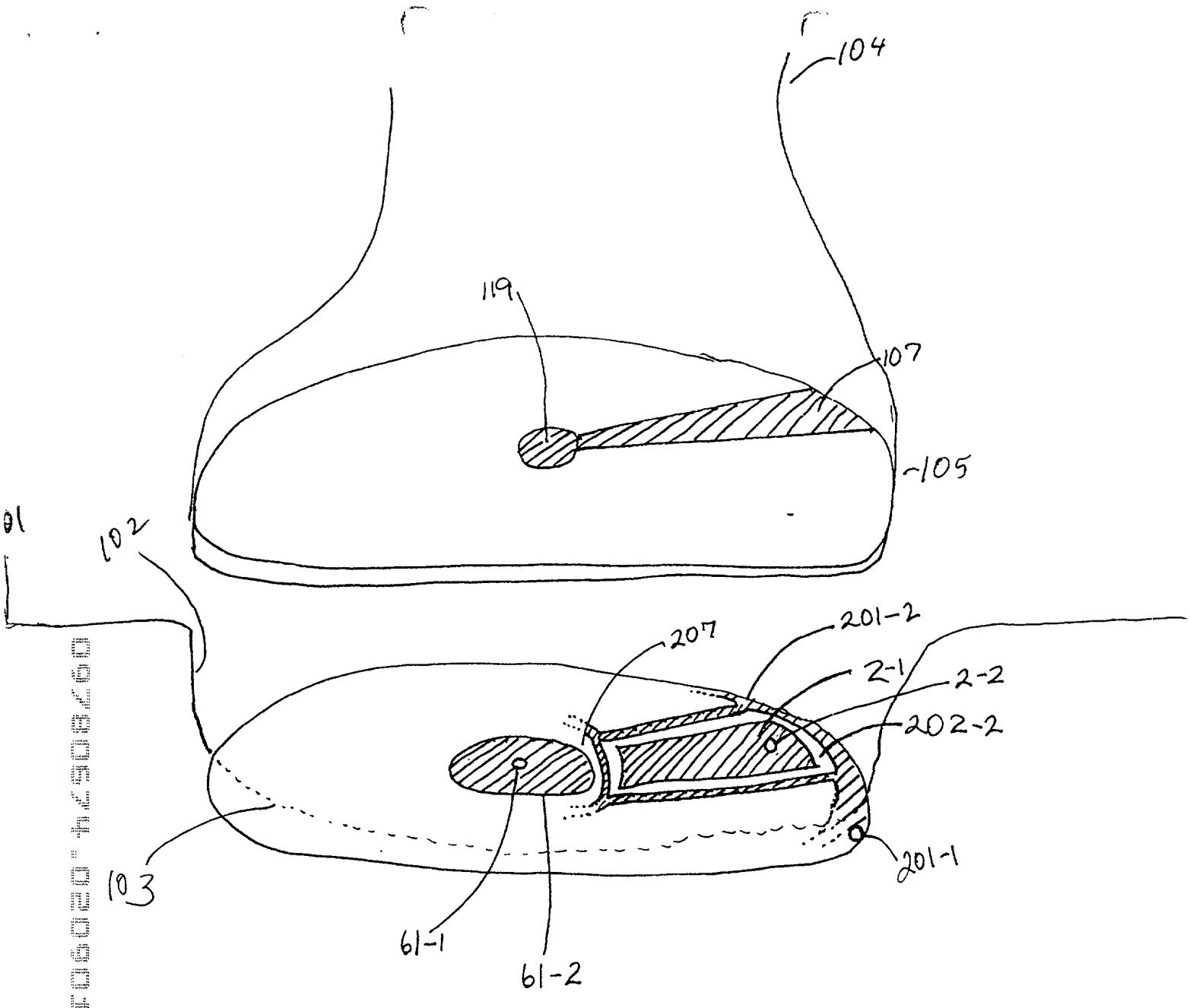


FIG. 6



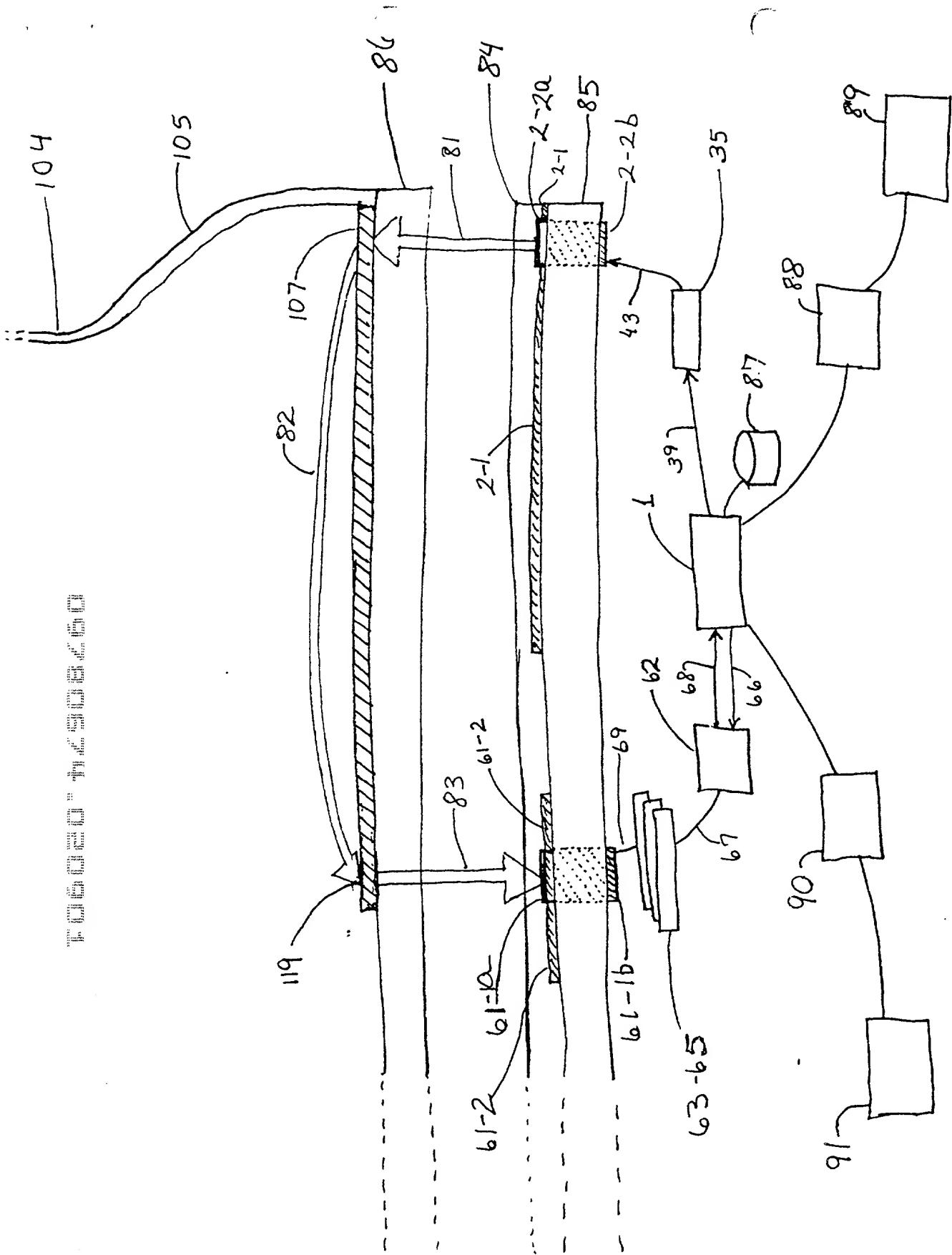


FIG. 12

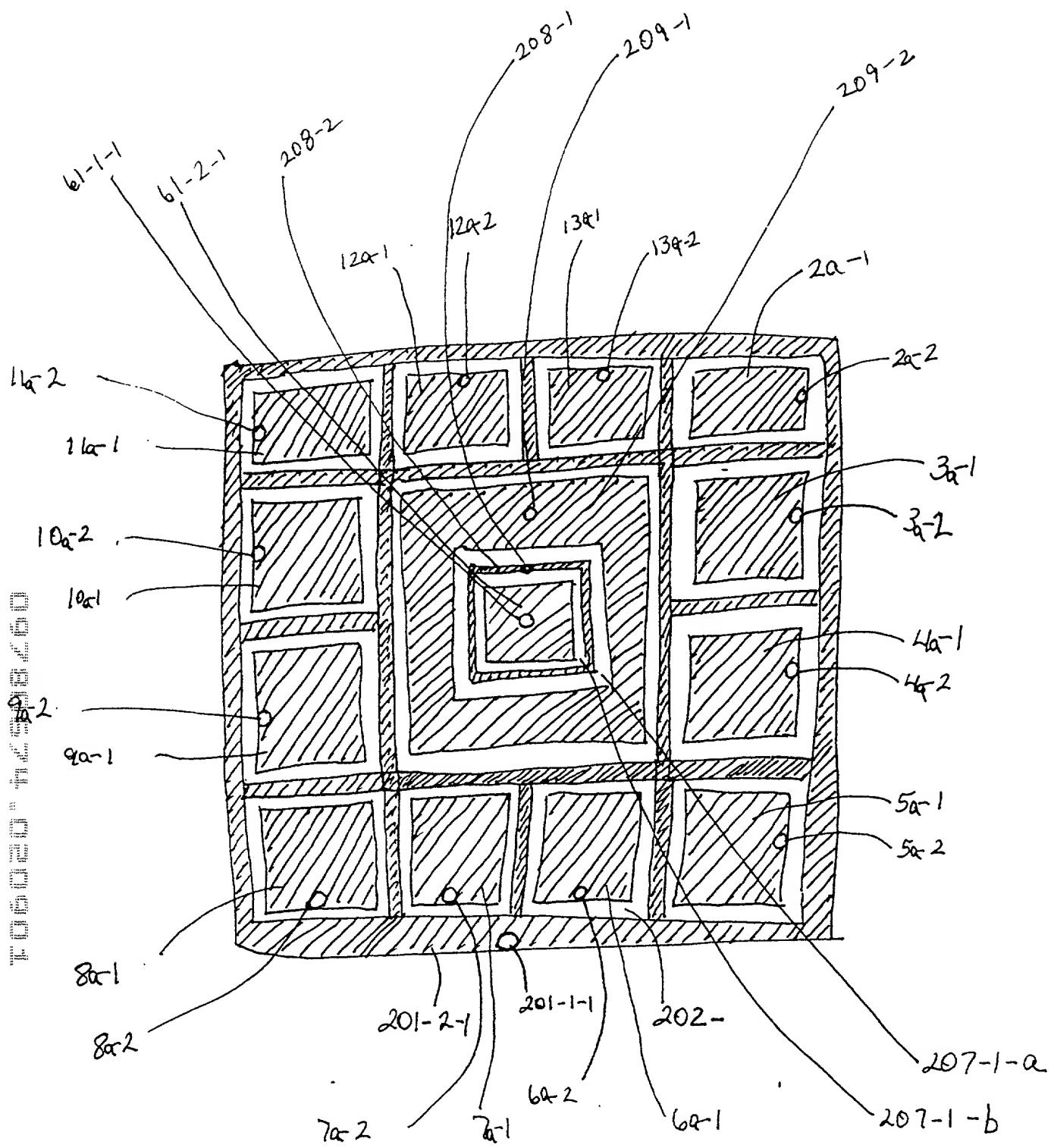


FIG. 21a

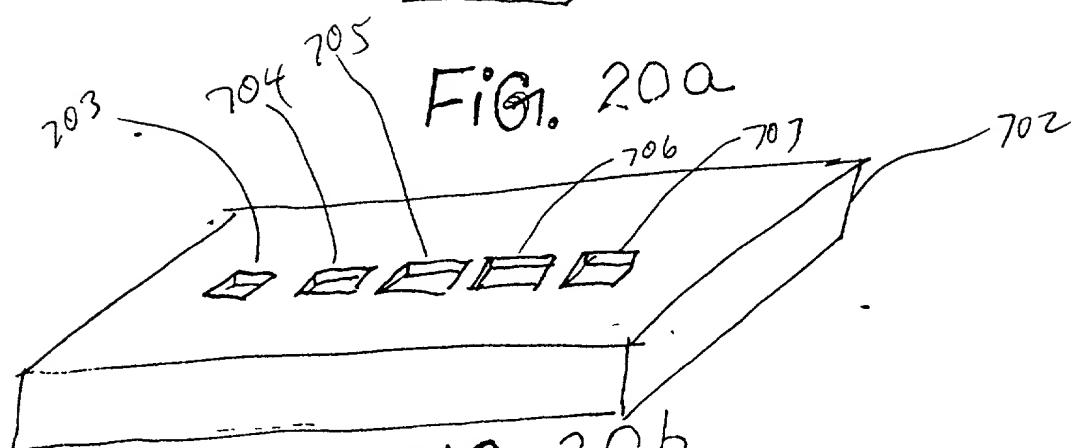
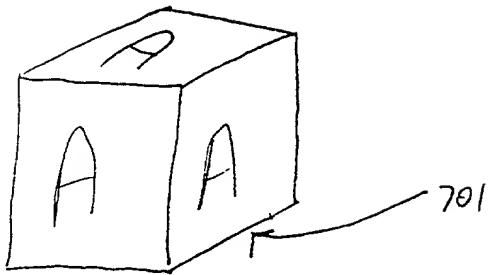


Fig. 20b

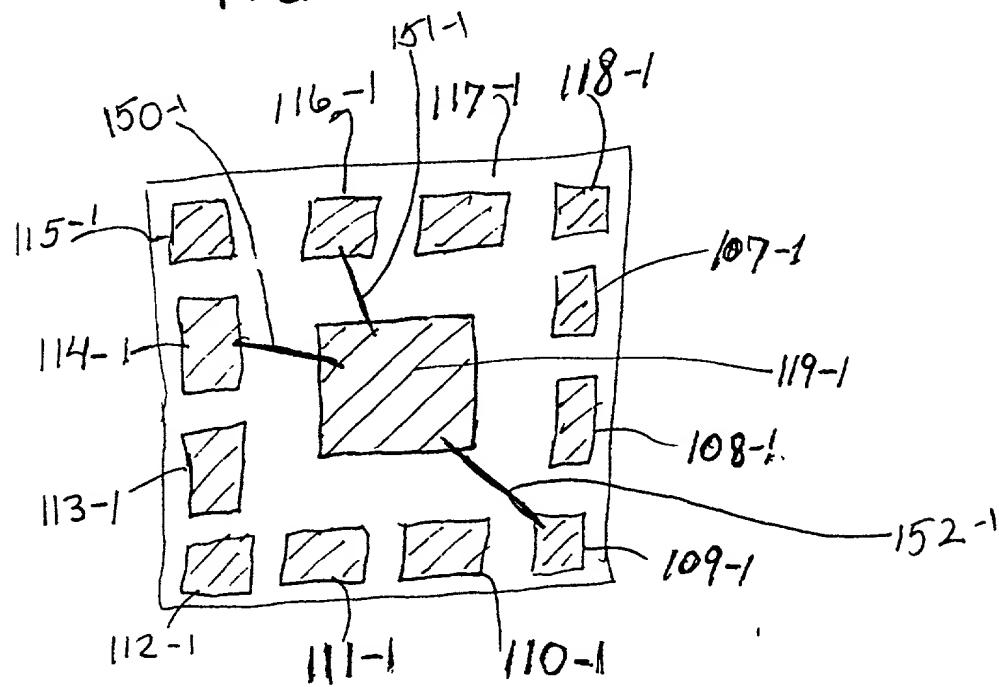


Fig. 20c

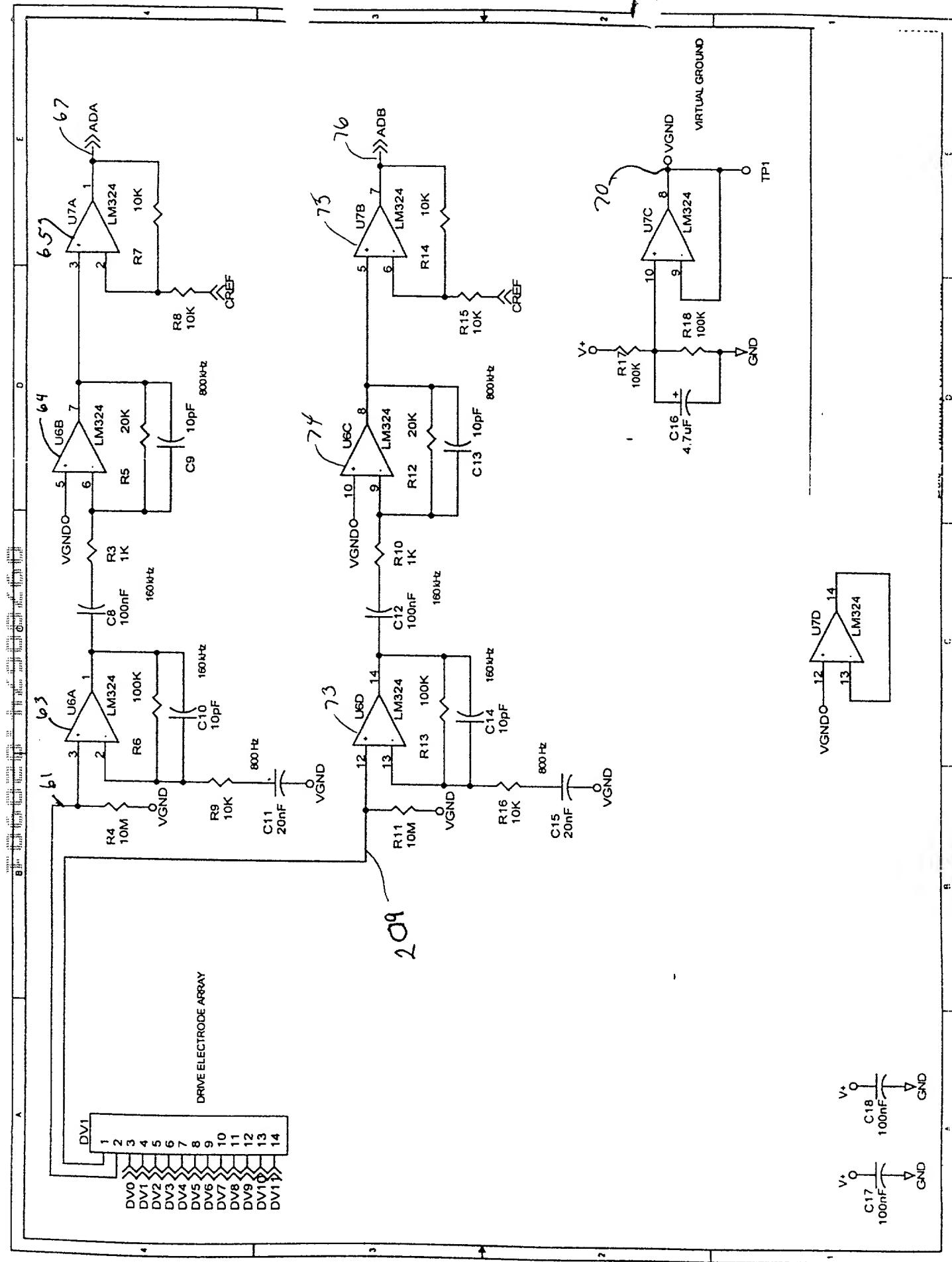


FIG. 91b

APPENDIX D

/Alphabet 50 dict dup begin

'a' aDict def
'b' bDict def
'c' cDict def
'd' dDict def
'e' eDict def
'f' fDict def
'g' gDict def
'h' hDict def
'i' iDict def
'j' jDict def
'k' kDict def
'l' lDict def
'm' mDict def
'n' nDict def
'o' oDict def
'p' pDict def
'q' qDict def
'r' rDict def
's' sDict def
't' tDict def
'u' uDict def
'v' vDict def
'w' wDict def
'x' xDict def
'y' yDict def
'z' zDict def

end

def

} def

/aDict LetterObj subclass dup begin
 /isvowel { true } def
 /snorm "31" def
 /sounds [
 "31"
 wavname
 readwav not { "readwav error" logstring } if
 dup buildwav not { "buildwav error" logstring } if
 "style1_a"
 wavname
 readwav not { "readwav error" logstring } if
 dup buildwav not { "buildwav error" logstring } if
] def
 end
def

```
/bDict LetterObj subclass dup begin
  /isyowel { false } def
  /snorm "1" def
  /sounds [
    "1"
    wavname
    readwav not { "file error" logstring } if
    dup buildwav not { "buildwav error" logstring } if
    "style1_b"
    wavname
    readwav not { "file error" logstring } if
    dup buildwav not { "buildwav error" logstring } if
  ] def
end
def
/cDict LetterObj subclass dup begin
  /isvowel { false } def
  /snorm "7" def
  /sounds [
    "7"
    wavname
    readwav not { "file error" logstring } if
    dup buildwav not { "buildwav error" logstring } if
    "style1_c"
    wavname
    readwav not { "file error" logstring } if
    dup buildwav not { "buildwav error" logstring } if
  ] def
end
def
/dDict LetterObj subclass dup begin
  /isvowel { false } def
  /snorm "2" def
  /sounds [
    "2"
    wavname
    readwav not { "file error" logstring } if
```

dup buildwav not { "buildwav error" logstring } if
"style1_d"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end

def

/eDict LetterObj subclass dup begin
/isyowel { true } def
/snorm "32" def
/sounds [
"32"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style1_e"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end

def

/fDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "3" def
/sounds [
"3"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style1_f"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end

def

/gDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "4" def
/sounds [
"4"
wavname
readwav not { "file error" logstring } if

dup buildwav not { "buildwav error" logstring } if
"style1_g"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/hDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "5" def
/sounds [
"5"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style1_h"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/iDict LetterObj subclass dup begin
/isvowel { true } def
/snorm "33" def
/sounds [
"33"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style2_i"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/jDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "6" def
/sounds [
"6"
wavname
readwav not { "file error" logstring } if

dup buildwav not { "buildwav error" logstring } if
"style2_j"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end

def
/kDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "7" def
/sounds [
"7"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style2_k"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end

def
/lDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "8" def
/sounds [
"8"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style2_l"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end

def
/mDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "9" def
/sounds [
"9"
wavname
readwav not { "file error" logstring } if

```
dup buildwav not { "buildwav error" logstring } if
"style2_m"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/nDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "10" def
/sounds [
"10"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style2_n"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/oDict LetterObj subclass dup begin
/isvowel { true } def
/snorm "34" def
/sounds [
"34"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style3_o"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/pDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "11" def
/sounds [
"11"
wavname
readwav not { "file error" logstring } if
```

```
dup buildwav not { "buildwav error" logstring } if
"style3_p"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/qDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "46" def
/sounds [
"46"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style3_q"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/rDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "12" def
/sounds [
"12"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style3_r"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/sDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "13" def
/sounds [
"13"
wavname
readwav not { "file error" logstring } if
```

dup buildwav not { "buildwav error" logstring } if
"style3_s"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/tDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "14" def
/sounds [
"14"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style3_t"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/uDict LetterObj subclass dup begin
/isvowel { true } def
/snorm "35" def
/sounds [
"35"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style4_u"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/vDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "15" def
/sounds [
"15"
wavname
readwav not { "file error" logstring } if

dup buildwav not { "buildwav error" logstring } if
"style4_v"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/wDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "16" def
/sounds [
"16"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style4_w"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/xDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "47" def
/sounds [
"47"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style4_x"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/yDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "17" def
/sounds [
"17"
wavname
readwav not { "file error" logstring } if

```
dup buildwav not { "buildwav error" logstring } if
"style4_y"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
/zDict LetterObj subclass dup begin
/isvowel { false } def
/snorm "18" def
/sounds [
"18"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
"style4_z"
wavname
readwav not { "file error" logstring } if
dup buildwav not { "buildwav error" logstring } if
] def
end
def
```